# LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT

## Fisheries Research Component

Sub-components:

- Fish Biology and Biodiversity
- Aquaculture
- Water hyacinth
- Socio-economics
- Information & Database

# PROJECT STOCK-TAKING REPORT 1997 - 2002

## FISH BIOLOGY AND BIODIVERSITY CONSERVATION SUB-COMPONENT

**Objectives:**

i) Provide information on the biology and ecology of the fishes to be used for sustainable exploitation of the fisheries and for improvement of stocks of endangered fish species.

ii) Provide information on the biodiversity of the lake's flora and fauna to be used in conservation of biodiversity and overall stability of the ecosystem;

| ISSUES | ACTIVITIES | OUTPUTS/ACHIEVEMENTS | IMPACTS | RECOMMENDATIONS |
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| 1. Collapse of the native fishery | Carried out Field Surveys to selected pilot areas within the Victoria basin area: Lake Victoria, River Nile, River Sio, Nabugabo lakes, Koki lakes, Lake Wamala, Kabaka's lake and Kyoga satellite lakes to generate information on endangered fish species<br><br>Develop management plans of each system in consultation with stakeholders | • Collected information on the biology and ecology of various endangered native species (i.e. native tilapiines (ngege), *Labeo* (ningu), Bagrus (semutundu), *Clarias* (male), Haplochromines (nkejje) and Mormyrids (kasulu), fishing gears and methods<br>• Fish species such as *Oreocrhomis esculentus* lost in the Victoria and Kyoga lakes are found in some satellite lakes<br><br>• Conducted 4 stakeholder workshops (Lake Victoria, Kyoga lakes, Kabaka's lake, Nabugabo lakes). | Improved information among stakeholders for management of minor lakes | Detailed results are given in the draft book on '**Biology and Ecology of Lake Victoria fishes: their development and management**'<br><br>Recommendations made for protection of these lakes made<br><br>Interventions on Kabaka's lake already implemented based on FIRRI recommendations<br><br>Nabugabo lakes area has already been designated a Ramsar |

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| | | | | designated a Ramsar site |
| 2. Potential collapse of the current fishery based on introduced fish species | Carried out Field Surveys to selected pilot areas within the Victoria basin area: (as in 1. above) to generate information on introduced fish species | Collected information on the biology, ecology and stocks of introduced fish species (i.e. Nile perch (mputa), Nile tilapia (ngege) and native *Rastrineobola argentea* (mukene)), fishing gears and methods | Improved management options based on the findings from the research. | Detailed results are given in the draft book on '**Biology and Ecology of Lake Victoria fishes: their development and management**' |
| 3. Declining Biodiversity | Carried out Field Surveys to selected pilot areas within the Victoria basin: (as in 1 above) to generate information on aquatic biodiversity (algae, invertebrates, fish, macrophytes, birds, small mammals, reptiles and amphibians) | Collected geo-referenced information on species diversity of fishes, invertebrates, phytoplankton, macrophytes, aquatic mammals, reptiles, birds and amphibians.<br>• Some satellite lakes support high species and trophic diversity<br>• Biological diversity changes with distance from shoreline, substrate type and texture of sediments<br>• Lakes with Nile perch have low species diversity compared to those without<br>• Abundance of some | Improved management options based on the findings from the research. | Detailed results are given in the draft book on '**Biodiversity of Lake Victoria, its conservation and sustainable use**'<br><br>Recommendations on biodiversity conservation formulated |

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| | | organisms (i.e. Blue-green algae, chironomids, chaoborids etc) correlate to water quality<br>• Roots of fringing macrophytes contain higher diversity and abundance of macro-invertebrates than sediments<br>• Muddy sediments contain lower diversity and abundance of macro-invertebrates compared to other sediment types<br>Collected information on genetics of *Labeo* Nile perch, introduced and native tilapiine and some haplochromines. Information shows:<br>• Loss of genetic variability of Nile perch since its introduction<br>• Genetic variability of *Labeo* with locality<br>• High and low genetic differentiation among populations of *O. esculentus* and *O. niloticus* respectively | | |

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| 4. Deterioration of the lake environment | Carried out Field Surveys to selected pilot areas within the Victoria basin: (as in 1 above) to generate information on aquatic environment in relation to fish stocks and biodiversity | Generated geo-referenced information on physical chemical characteristics i.e. secchi depth, chlorophyll, dissolved oxygen, pH, conductivity, phosphorus, nitrogen, carbon<br>• Physical- chemical characteristics vary between lakes;<br>• low secchi depth correlated with high chlorophyll concentration and oxygen deficit<br>• Occurrence and abundance of some organisms (i.e. blue-green algae, chironomids, chaoborids etc) correlate to water quality and can serve as bio-indicators<br>• Areas/lakes with high diversity and abundance of rotifers correlated with eutrophication | Greater awareness among stakeholders for environmental aspects. | Detailed results are given in the draft book on '**Biodiversity of Lake Victoria, its conservation and sustainable use**'<br><br>Recommendations on aquatic environment conservation formuiated |
| 5. Inadequate infrastructure and manpower | 1. Procurement of equipment and supplies; | • Equipment: (fishing gear, vehicles, outboard engines, computers, boats, microscopes, laboratory | Research more efficiently carried out. | |

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| | | supplies) procured<br>• MV Cormorant rehabilitated | | Vessel to be ready for operation in the next I month |
| | 2. Identification of project staff needs; | • Contracted 4 technicians and 5 research associates | | |
| | 3. Training | • 4 PhD's on-going<br>• 2 students completed MSc,<br>• 3 technicians attended short specialization courses (aquarium maintenance, fish genetics and invertebrate taxonomy) abroad.<br>• 2 scientist attended short specialised courses abroad (Haplochromine Taxonomy and stable isotope analysis)<br>• 6 scientists and 3 technicians trained in GIS Arcview 3.1 skills | | 60% of PhD training covered |
| | 4. Procurement of consultants | • Procured 1 consultancy in algal taxonomy | | Consultancy on production of two books pending regional harmonization of book chapters |
| 6. Lack of or inadequate research | Production of books, information posters | • Drafts of 2 two books prepared and are available | Greater awareness | |

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| information to stakeholders | and brochures | • 2000 copies of Information brochures on fishing gear and methods produced<br>• Developed, produced and distributed 100 copies of an information poster titled " *Invertebrates as important fishery and water resources*"<br>• Draft of technical guidelines for management of Lake Victoria produced<br>• 2 Student theses produced | among stakeholders on management and environmental issues. | Brochures and posters to be translated in local languages |
| | Sensitization, Workshops and conferences | • 3 regional technical and harmonization workshops and 3 National workshops held<br>• Sensitisation of communities around aquatic systems done during field surveys<br>• 6 scientists attended and presented papers at GLOW 111 international symposium at Arusha, Tanzania | | |
| | Rehabilitation of Museums and aquaria at FIRRI. | • Aquarium displays set up at 6 public places in Victoria basin area (UWEC, LVEMP Secretariat, JMC, Victoria Nile School and Busoga | | |

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| | Mass media events | Nile School and Busoga College, Mwiri and Kiira College Butiki.<br>• Aquarium and museum facilities at FIRRI received 5000 visitors / stakeholders<br>• Hosted 2 radio programs on local FM radio (NBS)<br>• Participated in a talk show on "Rampant degradation of Lake Victoria" hosted by Monitor FM radio;<br>• Conducted a public talk on the "Wealth of Lake Victoria - The Fisheries and Environment" for secondary school students and service organizations in Jinja; | | |

AQUACULTURE SUB-COMPONENT

**Objective:**

To enhance stocks of endangered fish species through aquaculture

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| 1. Poor infrastructure and manpower, poorly equipped lab and for field work at the station | 1. Procured equipment and supplies<br>2. Rehabilitated fish ponds<br>3. Constructed 5 new concrete tanks<br>4. Design a hatchery and water supply system<br>5. Trained staff – short and long-term | 1.Fishing gear, outboard engines, computers, microscopes, vehicles, lab and field supplies, etc. procured, Land and water transport improved;<br><br>2. Fry nursing and survival improved,<br><br>3. Ponds were cleared, desilted and repaired, water channels re-opened.<br><br>4. Design of hatchery and water supply system completed,<br><br>5. Staff were trained locally and abroad in various skills (3 in computing, 3 in aquaculture, 2 are about to complete Ph. D. programme 1 | Research activities more effectively carried out. | Improved facilities have resulted into increased production and survival of fish fry, (from 10,000 to over 50,000 fry per month), more fish ponds of farmers have been stocked,<br><br>Quality of research output has been greatly improved; |

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| | | is half way). | | |
| 2. Decline of populations of important commercial fish species in the wild. | 1.Developed technologies to breed *Labeo victorianus* (Ningu) in captivity,<br><br>2.Developed technologies to feed *L. victorianus* under culture conditions,<br><br>3.Stocks of *Bagrus docmac* and *O. esculentus* introduced into ponds. | 1. Ningu successfully bred in captivity,<br><br>2. Ningu fry reared to maturity in captivity,<br><br>3. Proved that these fish species can be cultured in ponds if they can be bred. | Important commercial species more available from aquaculture production. | Once popular fish species among fish-eating communities is about to be multiplied and cultured, hence diversifying culture of native fish species, |
| 3. Poor quality and low quantity of cultured native fish fry (Nile tilapia and *Clarias gariepinus*) | 1.Developed methods to improve the quality of fish fry and brood stock through selection and screening<br><br>2. More ponds were stocked with more brood stock of Nile tilapia and *C. gariepinus*<br><br>3. Compared performance of different strains of Nile tilapia, | 1. Performance of N. tilapia improved in Farmers' ponds,<br><br>2. Fry production of N. tilapia was increased from 10,000 to over 50,000 fry per week; from zero to 10,000 fingerlings of *C. gariepinus* per month,<br><br>3. L. Victoria strain of N. tilapia performed better than other strains, | Greater supply of fry to fish farmers. | More fish ponds have been prepared and stocked,<br>Availability of quality seed has attracted more people into fish farming and regarding fish farming as a business for generation of income and as a gainful activity for both the youth, women and men; |

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| 4. Poor accessibility and availability of fish fry to Fish Farmers | Training of private fish fry producers selected from the L. Victoria basin | 9 Private fry producers are producing N. tilapia fry and 5 are producing *C.gariepinus* fingerlings within the basin. | More fingerling supply to farmers. | Shortage of fish fry has been reduced and more ponds stocked with fish seed, |
| 5. Lack of appropriate and affordable fish feeds | 1.Developed fish feeds for larval *L. victorianus*,<br><br>2.Adapted techniques to produce live food for larval fish, esp. for *C. gariepinus* | 1.Diet improved growth rate of the fish species (almost doubled)<br><br>2.Survival rates of post-larval stage of *C. gariepinus* increased by 50%, | More feed supply among farmers. | Formulation of fish feeds and feeds for other fish species needs to be taken more seriously, especially if commercial aquaculture has to take off. More catfish produced in ponds are available in the market. |
| 6. Poor management of fish ponds by farmers resulting into poor fish yields, | 1. Trained farmers and Extension Service Providers in skills of pond management<br>2. Initiated participatory research program with farmers and extension staff | 1. A total of 56 fish farmers and 8 Service Providers were trained and fish yields have improved two to three-fold. | Improved skills among fish farmers. | On-farm trials have proved useful as a way of imparting management skills into farmers and extension staff as well as researchers learning from the others |
| 7. Unavailability of information to | 1.Packaged information, | 1.Baseline survey of status and potential for aquaculture | Greater awareness | More information about aquaculture |

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| guide aquaculture production | 2.Produced extension materials,<br>3. Produced news articles,<br><br>4. Participated in Agricultural, shows, TV and radio talks, technology demonstrations. | development compiled into a book<br>2.Booklet on pond siting and construction produced<br>3. four video tapes on aquaculture activities made,<br>4. Four different brochures produced. | among stakeholders. | and technical guidance on aquaculture is available now than ever before, given the fact that aquaculture is a fairly new farming practice among Ugandans. |

WATER HYACINTH RESEARCH SUB-COMPONENT

**Objective:**
To determine the impact of environmental degradation, especially by water hyacinth, on the fisheries of the lake

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| Lack of information on coverage of water hyacinth and possible losses of socio-economic benefits due to its proliferation. | Carried out field surveys within the lakes Victoria and Kyoga and their basins: the Northern waters of L. Victoria, Upper River Nile, river Kagera System, Lake Kyoga and its satellite lakes so as to generate information on the water hyacinth coverage, spread and distribution<br><br>Developed water hyacinth management strategies for the lakes and its key areas of economic value in collaboration with | • Collected information on the spatio-temporal abundance and distribution of spread of water hyacinth in lakes Victoria and Kyoga.<br>• Obtained information on the movement of water hyacinth in Lake Victoria so as to guide control effort.<br>• Mobile water hyacinth covered about 1800 ha by 1998 in lake Victoria lakes.<br>• Water hyacinth cover over lake Victoria at the climax of the infestation in 1998 was 12,000 ha (4000 ha in Uganda, 2000 ha in Tanzania and 6000 ha in Kenya)<br>• Significant reduction (about 90%) of water hyacinth coverage by | Awareness among stakeholders on coverage and spread of water hyacinth. | Detailed information on water hyacinth in Uganda are given in two reports, both submitted to His Excellency the President of the Republic of Uganda:<br>i) Experiences with managing water hyacinth infestation in Uganda, 2002, and<br>ii) The status of the water hyacinth infestation in Uganda, 2001. |

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| | MAAIF and NAARI and grassroot stakeholders | hyacinth coverage by the year 2000 due to biological and mechanical control.<br>• Infrastructure for early detection of water hyacinth resurgence in place.<br>• Infrastructure of control of water hyacinth resurgence be mechanical and biological means exist. | | |
| Potential collapse of the fishery due to water hyacinth impacts | Carried out field studies in selected inshore and offshore regions in lakes Victoria and Kyoga, especially during the period of massive collapse of WH biomass so as to generate information on: the magnitude; dynamics and impacts of the water hyacinth problem on the water quality and the fishery. | Collected information on the biology, ecology and biomass and distribution of fish species (e.g. Nile perch, Nile tilapia and *R. argentea* (mukene) in areas with varying intensities of water hyacinth infestation and evaluated the weed impacts on biodiversity and the fisheries.<br>• Massive collapse of water hyacinth biomass enhanced degradation of water quality, reduction in biodiversity | Greater awareness among stakeholders. | Detailed results are given in the draft book on "Experiences with managing water hyacinth infestation in Uganda, 2002.<br>Detailed results are in a paper: Impacts of sunken water hyacinth on aspects of water quality, diversity and abundance of micro-invertebrates and fish in northern lake Victoria. |

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| | | reduction in biodiversity and was detrimental to a sustainable fishery in both lakes Victoria and Kyoga. | | |
| Potential collapse of biodiversity due to water hyacinth impacts | Carried out field surveys as in (2) above to generate information on water hyacinth influences on aquatic biodiversity (algae, invertebrates, fish and macrophytes) | • Biodiversity was low in areas of massive water hyacinth infestation, especially under the stationary WH mats.<br>• Water hyacinth-free areas contained high diversity and abundance of fish, macro-invertebrates and algae compared to areas heavily infested with stationary massive water hyacinth mats.<br>• Only organisms (e.g. chironomids0 tolerant to low oxygen conditions lived under or within the massive water hyacinth mats.<br>• Algal biomass was very low under or within the WH infested areas due to shading by the | Greater awareness among stakeholders. | Detailed results are given in the draft book: "Impacts of sunken water hyacinth on aspects of water quality, diversity and abundance of macro-invertebrates and fish in Northern Lake Victoria. Further studies need to be done to evaluate the ecological succession as a potential tool inn WH control and management. |

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| | | weed.<br>• Ecological succession of water hyacinth with native macrophytes especially the hippo grass did occur along the lakeshores. | | |
| Limited information on water hyacinth production zones. | Collected geo-referenced information on water hyacinth production zones and hot spots to guide control measures. | Obtained geo-referenced information on water hyacinth production zones and hot spots and possible physico-chemical and hydrological factors favouring WH proliferation documented for lake Victoria.<br>• Areas receiving high nutrient loads from the land such as Murchison Bay in Kampala are water hyacinth production factories as they allow rapid WH growth and multiplication.<br>• Sheltered bays and gulfs allow development of large non-mobile WH mats. | Greater awareness among stakeholders. | Detailed results are given in the draft book: Biodiversity of Lake Victoria, its conservation and sustainable use. |

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| | | • Open waters that often experience moderate to strong turbulence due to wind stress hardly support neither WH growth nr massive mats.<br>• Appropriate recommendations on the root factors promoting water hyacinth infestation in Lake Victoria have been formulated. | | |
| Water hyacinth nutrient status and the role of nutrients in the proliferation of water hyacinth. | Performed experiments *in situ* and in the laboratory to indicate water hyacinth responses to nutrient availability and enrichment. | Water hyacinth did very well in nutrient-rich areas, especially in the nutrient-rich riverine systems.<br>• Nutrient exhaustion led to poor water hyacinth performance in both laboratory and field experiments.<br>• Water hyacinth growth increased with increased nutrient additions.<br>• Appropriate recommendations that | Greater awareness among stakeholders. | Detailed results are given in the draft book: "Biodiversity of Lake Victoria, its conservation and sustainable use'. More information is being generated by a PhD student at the University of Florida. |

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| | | nutrient reductions, especiallyphosphorus into water bodies will lead to reduction in water hyacinth proliferation has been made. | | |
| Degradation of the water environment | Carried out field surveys in lakes Victoria and Kyoga, Upper Victoria and river Kagera system to determine possible water hyacinth impacts on water quality and the overall aquatic environment, especially during the period of massive WH biomass collapse. | Generated information on the water chemistry (e.g. nitrogen, phosphorus, carbon, chlorophyll-a) and the physical environment (e.g. watr transparency, depth, light, dissolved oxygen, pH, conductivity):<br>• Low lake transparency correlated with high turbidity due to particular organic matter from WH roots and from algae.<br>• High organic matter from WH and algae contributed to low light availability in the water column and low oxygen conditions in bottom waters.<br>• Low oxygen condition | Improved control based on information on causes of weed production. | |

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| | | in turn, influenced nutrients, e.g. enhanced release of phosphorus from organic forms and was pronounced during periods of massive WH biomass collapse in Lake Victoria. | | |
| Inadequate infrastructure and manpower for water hyacinth research. | Procured equipment and supplies<br>Identified project staff needs<br>Provided training | • Equipment: (vehicle, outboard engines, computers, microscopes, spectrophotometer, light meters and various laboratory supplies) procured.<br>• Contracted 2 Research Associates, 3 Technicians, 1 Driver and 2 Coxswains.<br>• 2PhDs on-going.<br>• 2 Scientists and 1 Technician trained in GIS Arcview 3.1 skills. | Moe effective research due to improved facilities and manpower. | |
| Lack of or inadequate research information | Production of books, brochures, posters and fact sheets.<br>Stakeholder | • Produced 2 water hyacinth reports.<br>• Draft of 1 water hyacinth book in | Greater awareness due to findings from research. | |

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| released to stakeholders. | sensitization, workshops and conferences. Mass media events. | preparation.<br>• Brochures on water hyacinth in Uganda being done.<br>• Developed, produced and distributed copies of a poster on water hyacinth and other invasive weeds in Uganda.<br>• Contributed to Technical Guidelines for Fisheries Management of Lake Victoria.<br>• Delivered water hyacinth information at 3 regional technical and harmonization workshops and 3 National workshops held.<br>• Participated in creating awareness of the water hyacinth problem and possible control to lakeshore communities, especially during the field surveys. | | |

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| | | • Conducted a public talk on the "Water hyacinth problem" hosted by the Network of Environmental Journalists for Lake Victoria, Jinja, 2002. | | |

## SOCIO ECONOMICS RESEARCH SUB-COMPONENT

**Objective:**
Generate, package and disseminate scientific knowledge and build capacity to develop options for (a) optimisation of socio-economic benefits from fisheries, (b) for co-management and development of polices, laws and regulations for management of fisheries aquatic environment.

| ISSUES | ACTIVITIES | ACHIEVEMENTS | IMPACTS | RECOMMENDATIONS |
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| 1. Scattered information on socio-economic dimensions of Lake Victoria fisheries from previous and ongoing projects. | Identified and reviewed relevant socio-economics publications on Lake Victoria | 1.Existing information compiled: - About 300 socio-economics publications on Lake Victoria identified and reviewed. The studies were mainly on fishing communities and fish marketing. | Better understanding of the socio-economic situation on L. Victoria among stakeholders. | Provisions should be made to review documents outside FIRRI<br><br>New documents have come up which should be reviewed |
| 2. Inadequate information on the extent to which communities are involved in the activities from harvesting up to the marketing of fish. | Conducted a survey on community involvement in fishing industry | 1400 respondents interviewed<br><br>Draft technical report produced<br><br>Results include: -<br><br>(a) Delineation of the fisheries sector into the three major components, namely production, processing and marketing.<br><br>(b) Information on the status of fishing settlements.<br><br>(c) Socio-economic characteristics of the different categories of fishery workers.<br><br>(d) Main constraints to fish production, namely fish scarcity, gear and boat limitations and regulations.<br><br>(e) Low levels of business skills including inadequate book keeping and managerial skills.<br><br>(d) Inadequate credit facilities and poor risk management. | Greater awareness of the livelihood opportunities within the fisheries, from production to consumption. | Final technical report should now be produced.<br><br>Findings should be widely disseminated |

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| | | (e) Unfavorable social factors, particularly the role of culture and indigenous knowledge.<br>(f) High fish spoilage and lack of facilities for fishers to deal with it.<br>(g) Poor local market for fish due to low purchasing power, leading to low prices.<br>(h) Frequent bans on fish exports<br>(i) Unfavorable pricing mechanisms, where buyers (fish traders) set prices for the fishers.<br>(j) Inadequate institutional support to fishers in the areas of extension, research, fisheries management, policies and development projects. | | |
| 3. Lack of information on how activities of the fisherfolk contribute to degradation of the environment. | Conducted a survey on the impact of fishery activities on fisheries resource degradation and the environment, including trees/forests, shrubs and grass, wetlands, domestic, human and fishery wastes.<br>Conducted 3 district level workshops | 1000 respondents interviewed.<br>3 district level workshops held.<br>Draft technical report produced.<br>Information generated on: -<br>a) Knowledge among fishers on the importance of the different elements of their environment.<br>b) Fishery activities that utilize resources from the different types of environment.<br>c) Threats to the different environmental resources.<br>Preferences among fishers for the different regulatory options. | Greater awareness and improved environmental practices among the fishing communities. | Final report to be prepared and findings to be disseminated |
| 4. Inadequate knowledge on the level of nutrition, health and other social amenities of the lake side communities. | Conducted a survey of nutritional status, health and social amenities of the lakeside communities.<br>Conducted dissemination | 300 respondents interviewed.<br>3 district level workshops held.<br>The survey generated results on: | Improved facilities at fish landings. | Final technical report should be produced.<br>Results to be disseminated |

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| | workshop | ▪ The main food items consumed by the fishing communities.<br>▪ Fluctuations in availability of food items during the year.<br>▪ Recommendations for strengthening food supply to the fishing communities.<br>▪ The main diseases at the landings as perceived by the fishing communities, namely malaria, typhoid, cholera, bilharzia, skin rash and HIV-AIDS. | | |
| 5. Lack of information on the current fishery distribution patterns taking into account biological, social and economic implications. | a) Formulated and pre-test unit questionnaire<br>(b) Conducted unit questionnaire interviews with 600.<br>(c) Carried out 20 key informant interviews<br>(d) Held 6 FGD's<br>(e) Entered and analyse data<br>(f) Produced technical report | 400 unit questionnaires filled.<br>20 key informant interviews conducted.<br>Consulted communities involved at 10 beaches through FGD'S.<br>Data set generated<br>Results indicate impacts on income distribution, employment, nutrition and wealth ownership | Better understanding of the impacts of fishery distribution patterns on viability of fishery enterprises. | Final technical report should be produced.<br>Results to be disseminated |
| 6. Poor understanding of the socio-cultural issues relating to sanitation, fish handling and artisanal fish handling. | a) Literature search<br>b) Developed and tested questionnaire<br>c) Primary data collection<br>d) Data entry and analysis<br>e) Technical report writing | Literature review report produced.<br>507 respondents interviewed in 4 districts.<br>Draft technical report written and submitted for review.<br>Fact-sheet produced<br>Socio-cultural issues relating to fish handling, processing and sanitation and the causes have been identified.<br>Issues of sanitation were non-use/possession of latrines and waste disposal sites.<br>The factors were the unsuitable nature of the soils for latrine construction; cultural beliefs of some fishers and lack of | Improved attitudes of fishing communities in relation to sanitation, fish handling and processing. | Final report to be produced.<br>Findings to be disseminated. |

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| | | awareness.<br><br>Issues of fish handling were: dragging of fish along shoreline ground and sitting on fish during distribution.<br><br>The factors were lack of facilities, poor community leadership, inadequate means of transport and inaccessibility of ice especially to fishers on the Islands.<br><br>The issues of artisanal fish processing were: processing of spoiled fish and spreading mukene on bare ground.<br><br>The factors were: poverty, scarcity of fresh fish, and lack of spreading facilities. | | |
| 7. Inadequate information on economic viability of fisheries enterprises in the Lake Victoria region; | (a) Literature search<br>(b) Conducted 3 FGD's and pretested research instruments<br>(c) Conducted unit questionnaire interviews with 1000 fishing unit owners/ renters<br>(d) Provided 1000 fishing unit owners with data entry sheets<br>(e) Entered, screen and analyze survey data<br>(f) Prepared technical report | a) Literature review report produced<br>(c) 559 unit questionnaires & 329 data entry sheets collected<br>(d) Cost structure and profitability of fishing enterprises determined<br>(e) Factors responsible for the variations in profitability identified<br>(f) Share proportion between crew and fishing unit owners established<br><br>Draft technical report produced.<br><br>Fact-sheet produced. | Better investment decisions among fishers. | Final report to be produced.<br><br>Findings to be disseminated. |
| 8. Inadequate information on socio-economic impact of water hyacinth; | a) Reviewed related literature.<br>b) Key informant interviews with managers of key installations.<br>c) Conducted 5 FGDs and test data collection instruments.<br>d) Data collection in 3 districts to assess current resurgence impacts.<br>e) Data entry and analysis | Literature review report produced<br>Draft technical report produced<br>Impacts and costs associated with water hyacinth at local and institutional levels estimated.<br><br>Awareness and socio-economic impacts of the water hyacinth resurgence established.<br><br>Level of preparedness of local communities | Greater awareness among stakeholders on the impacts of water hyacinth. | To establish gains associated with water hyacinth.<br><br>Final report to be produced.<br><br>Findings to be disseminated. |

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| | | and institutions towards resurgence assessed.<br><br>Impacts of sunken water hyacinth established. | | |
| 9. Lack of knowledge on the impact of micro projects on the local communities; | (a) Relevant literature review<br>(b) Conducted FGDs and key informant interviews<br>(c) Administered questionnaires to 1000 respondents<br>(d) Data entry and analysis<br>(e) Prepared technical report | Literature review included in report.<br>702 questionnaires filled.<br>30 FGDs held.<br>24 micro-projects visited.<br><br>Issues affecting the establishment of micro-projects included:<br><br>a) Limited experiences of the Community Participation Implementation Committees (CPICs) with planning, budgeting and financial accountability.Inadequate community participation through contribution of cash, labour and local materials.<br><br>b) Poor information flow to the communities, particularly due to irregular project meetings.<br><br>c) Lack of transparency by some of the Finance Committees.<br><br>d) Migratory behaviour of fisherfolk that hinders sensitisation and mobilisation.<br><br>e) Delayed disbursement of funds.<br>Success of the completed projects observed. Communities have benefited through improved sanitation, decreased occurrence of diarrhoeal diseases, better access to clean water, improvements in literacy levels, better access to improved health facilities, better fish handling facilities and knowledge and skills to expand on or construct new project facilities.<br><br>Some micro projects were incomplete while | Improved planning and management of micro-projects. | The study should be continued. |

| ISSUES | ACTIVITIES | ACHIEVEMENTS | IMPACTS | RECOMMENDATIONS |
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| | | some had not taken off due to finacial constraints.<br><br>Project sustainability strategies also not working successfully. | | |
| 10. Lack of information on the Interests and concerns of lakeside communities in relation to management of satellite lakes | (a) Reviewed relevant literature<br>(b) Conducted FGD's and unit questionnaire interviews<br>(c) Entered and analyzed data<br>(d) Held public awareness workshop<br>(e) Prepared technical report | 100 respondents and 5 key informants interviewed<br>5 FGD's held.<br>Activities taking place around the lake identified<br>Socio-economic and cultural values attached to the lakes documented.<br>Fishery related problems encountered by riparian communities identified.<br>Existing local based management institutions examined<br>Presentation made at Nabugabo Workshop | Greater participation of the fishing communities in fisheries management on the satellite lakes. | |
| 11. Lack of information and documentation on the establishment and performance of 120 BMU's in support of the co-management program on L. Victoria | (a) Reviewed relevant literature<br>(b) Conducted FGD's and unit questionnaire interviews<br>(c) Entered and analyzed data<br>(d) Held public awareness workshop<br>(e) Prepared technical report | 30 BMUs surveyed<br><br>Interim report produced. | Better organisation among fishing communities on L. Victoria<br><br>Greater participation in fisheries management. | The study to continue. |
| 12. Inadequate information on the fish demand at local markets to determine the supply-demand situation and the willingness to pay for fish. | Conduct 11 Key Informant interviews<br><br>Administer 1000 unit questionnaire interviews<br><br>Enter data and prepare technical report. | Detailed study proposal produced.<br><br>Data collection instruments produced.<br><br>Literature review began. | Findings not available yet. | Field data collection should begin. |

| ISSUES | ACTIVITIES | ACHIEVEMENTS | IMPACTS | RECOMMENDATIONS |
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| 13. Lack of information on the volume and value of the fish export to neighbouring countries of Congo, Rwanda and Kenya. | Review existing records of fish marketing and regional exports.<br><br>Conduct 8 Key Informant interviews<br><br>Administer 400 unit questionnaire interviews<br><br>Analyse data and prepare technical report. | Detailed study proposal produced.<br><br>Data collection instruments produced.<br><br>Literature review began. | Findings not available yet. | Study to continue. |
| 14. Lack of information on the adoption of fisheries research technologies by the target beneficiaries. | Select 2 main technologies released by FIRRI for adoption study.<br><br>Conduct 400 questionnaire interviews for each of the technologies<br><br>Enter and analyse data<br><br>Produce draft report for internal and external reviews<br><br>Present draft findings at stakeholders' workshop | Relevant literature reviewed.<br><br>Methodology for study developed.<br><br>Study proposal prepared. | Findings not available yet. | The study should now be implemented. |
| 15. Inadequate facilities for socio-economic research; and | Procured office and field equipment. | (a). Equipment procured included 1 vehicle, 2 motorcycles, 1 outboaard engine, 1 computer, 1 laptop, 1 inflatable dingy, a video set complete with camera, deck and TV, a photocopier, a generator, 2 tape recorders, a public address system and a fax machine. | Socio-economics research more effectively carried out. | |
| 16. Inadequate personnel to carry out sub-component activities. | Recruited personnel:<br><br>1 Sub-program Leader<br><br>4 Research Assistants<br>2 Technicians<br>1 Driver | Personnel recruited:<br><br>1 Sub-program Leader<br><br>4 Research Assistants<br><br>2 Technicians | Sufficient manpower to carry out research. | Contracts of the personnel should be renewed for the next year |

| ISSUES | ACTIVITIES | ACHIEVEMENTS | IMPACTS | RECOMMENDATIONS |
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| | | 1 Driver | | |
| 17. Inadequate technical capacity for socio-economics research. | Provided PhD training. | 1 PhD obtained | Expertise available for research. | Short courses to be considered for research team. |
| 18. Inadequate research skills among project personnel on analysis and report writing on the on-going studies | (a) Submitted proposal to Secretariat<br>(b) Prepared training workshop materials<br>(c) Made workshop arrangements<br>(d) Held workshop<br>(e) Produced workshop report | 1 training workshop held. | Personnel trained in research methodologies. | Response awaited from Secretariat. |
| 19. Research findings not disseminated to fisherfolk and resource managers | Conducted village level, district, national and regional workshops | 2 Regional harmonization workshops held.<br>2 National workshops held.<br>6 District stakeholders' workshops held.<br>Several beach level meetings have been held. | Research activities harmonised with riparian states.<br>Awareness and knowledge created in fisheries stakeholders. | |

## INFORMATION AND DATABASE SUB-COMPONENT

**Objective:**

To avail information and database of the lakes resources to stakeholders.

| ISSUES/OBJECTIVES | ACTIVITIES | ACHIEVEMENTS | IMPACTS | RECOMMENDATIONS |
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| 1. Rehabilitate and expand library infrastructure to provide more space and transform the infrastructure into a data centre. | 1. Library rehabilitation and expansion into an Information and Data Centre. | 1. An extension has been added to the existing library to establish the Information and Data Centre.<br>2. Library shelf space increased.<br>3. Fumigation of library and component assets undertaken. | | Full establishment of the Information and Data Centre has not been completed yet. |
| 2. Establish a Local Area Network (LAN), email, internet access and on-line publication. | Connect offices and laboratories to LAN. | 1. A Local Area Network (LAN) established to 60% capacity. | Improved communication among researchers. | This has enabled scientists to share software and hardware and also hook onto the Internet. |
| 3. Set up electronic communication networks to ease access to fisheries information. | 1. Establish 24-hour wireless Internet access.<br>2. Install communication (modular telephone system). | Real time internet connectivity achieved. | Improved communication among researchers. | The Internet has enabled scientists to access online journals for scientific comparisons and other literature. |
| 4. Develop bibliographies on Lake Victoria to ease accessibility to information by stakeholders. | 1. Sorting, Photocopying and classifying literature.<br>2. Information backup to reduce information losses. | 1. Lake Victoria literature created in the FIRRI Information and Data Centre.<br>2. Institute data has been backed on CD ROMS and Zip diskettes. | Access to documents eased. | An increase in the number of visitors to the Data Centre looking for information from 50 people per month in 1997 to 300 per month by December 2002. |
| 5. Collection of | Collecting reprints, | 1. 300 reprints on lake Victoria. | Awareness increased | Copies of collected information |

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| information and setting up a database on Lake Victoria fisheries to ease accessibility to fisheries information. | dissemination events, making copies of relevant literature in digital format and in hard copies. | 2. 10 theses on lake Victoria.<br>3. A section of lake Victoria literature created for stakeholders to easily access.<br>4. 1945/1997 (50) Annual reports have been digitalized for easy access by a wider audience.<br>5. Web site design near completion.<br>6. 4 Videotapes made.<br>7. 600 books / rebounds.<br>8. 50 copies of books on water hyacinth resurgence prepared and distributed.<br>9. 500 copies of experience with managing water hyacinth prepared and distributed.<br>10. Victoria and Kyoga basin workshop reports prepared and distributed among stakeholders. | among stakeholders. | have been widely distributed among various stakeholders,and more awareness of literature has been achieved. There is need to digitise this information and have it under a virtual library on the FIRRI website. |
| 6. Avail information from fisheries to stakeholders to avoid a collapse in the native fishery and ensure a stable lake environment. | Mass media events;<br>1. Prepare newspaper supplements and news bulletins.<br>2. Mass production of brochures, posters, books and booklets.<br>3. Host different stakeholder groups to the Institute for educational purposes.<br>4. Organise stakeholder workshops.<br>5. Hold live- | 1. 30 Newspaper supplements disseminated through New Vision, Monitor, Bukedde and East African.<br>2. 6000 FIRRI Brochures distributed to stakeholders.<br>3. 6,000 advice on fishing gears brochures and 6,000 advice on fishing gears posters printed and distributed.<br>4. 2,000 library fact sheets printed and distributed.<br>5. 4000 FIRRI functions posters printed and distributed.<br>6. Visitors to the institute increased from 300 per year to 12,000 by 2002.<br>7. 4 stakeholders' workshops held bringing together fisheries officers, local authorities, fisher folk, etc.<br>8. 150 copies of books on water hyacinth resurgence distributed.<br>9. 50 copies of books on water hyacinth management distributed.<br>10. 64 live-phone in radio talks (Nile perch, Mukene, Aquaculture, water hyacinth) held. | | This information has been widely distributed among various stakeholders with the aim of empowering them to increase and sustain fish production and utilisation to overcome poverty in order to make management decisions.<br>There is need for strengthening the dissemination/outreach programme around the lake. |

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| | phone in radio and television talk shows. | | | |
| 7. Compile and disseminate information on Lake Victoria on CD-ROM | 1. Acquire Electronic databases.<br>2. Make CD-ROMS.<br>3. Establish a web site with hyperlinks. | 1. Three online databases i.e. IDEAL, EBSCO and Blackwell Synergy accessed from FIRRI by Scientists and stakeholders.<br>2. 4 CD-ROMS on Library holdings and selected texts.<br>3. Web site design near completion. | | The website will be user friendly making an impact across a wide range of interest groups in the fisheries sector. It will have a virtual library allowing sharing of FIRRI library literature subscription for the E-journals should be maintained. |
| 8. Set up desktop publication capabilities. | Procure equipment and set up GIS facility. | 1. One secretary trained in desktop publishing to effectively produce information materials for different stakeholder groups.<br>2. 6 PCs acquired.<br>3. 2 Scanners acquired.<br>4. 1 plotter acquired.<br>5. 2 Colour printers acquired.<br>6. 2 CD Writers acquired.<br>7. 3 softwares i.e. Publisher, Page maker and Acrobat Reader acquired.<br>8. 2 Zip drives acquired.<br>9. 5 desk and 4 computer stands have been received. | | The facilities are shared with other LVEMP components. There is need to acquire more PCs. There is need to acquire ARC View and Spatial Analyst for the Institute. |
| 9.Procure several categories of equipment for library and database functions. | Procurement of equipment and furniture. | 1. Backup telephone line maintained. | | No Electronic communication blackouts. |
| 10. Procure and up-date relevant journals/periodicals (from 1995 to present) and stocking the library with books. | Improve literature stocks. | Electronic database CD ROMS acquired. | | Improved access to literature. |
| 11. Improving human resource capacity to operate a fully functional Fisheries Data Centre by training library and database staff. | Staffing and training. | 1. Role of outreach established.<br>2. Short courses undertaken i.e. Systems Administration, Computer applications and literature acquisition.<br>3. Component staff recruitment i.e. Component Finance Assistant, | | Human resource capacity has improved in the delivery of information to various groups of stakeholders. |

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| | | Secretary, Statistician and Training/dissemination Officer. | | Improved access to information. |
| 12.Strengthening Data and Information networks with regional research centres and projects. | 1. Formation of National and Regional working groups. | 1. Formed National and Regional working group on Lake Victoria fisheries database.<br>2. Completed A Regional Task Force Report on Fisheries Database. | | |

# WAY FORWARD

## 1. ISSUES FOR FISHERIES RESEARCH UNDER LVEMP II

1.1. The sustainability of the Lake Victoria resources and promotion of biodiversity recovery

1.2. The sustainability of exploitative resource use patterns by private investors and local communities to generate food, income and employment

1.3. Ecosystemic research and monitoring based on current information/data against which future trends can be discerned

1.4. Strategic research (e.g. EIAs collapse of the Nile perch fishery, water hyacinth resurgence, changes in water levels, pollution loading, private sector investments)

1.5. Monitoring impacts of fisheries research under LVEMP-I

1.6. Information and database development and management

## 2. PRIORITY AREAS FOR FISHERIES RESEARCH UNDER LVEMP II

2.1. Research and piloting socio-economic activities and micro-projects from adoption studies and monitoring their impacts on fisherfolk behaviour patterns

2.2. Based on biodiversity surveys of LVEMP I develop a long term monitoring program to document further decline or recovery of aquatic biodiversity in lake Victoria and its Satellite lakes.

2.3. Through the EU phase III program initiate a monitoring program of stock assessment using multiple methods including hydroaccustics, index trawling, catch monitoring and trophic modelling to provide recurrent data on fish stocks.

2.4. In partnership with WRMD, develop an integrated monitoring program of indicative physio-chemical and biological properties to evaluate the health of the lave Victoria ecosystem.

2.5. Establish a national and regional monitoring program for water hyacinth abundance.

2.6. Conduct risk assessment of health status of fishing communities and evaluated socio-economic factors as well as biological factors, which contribute to health status of these communities.

2.7. Support efforts of Fisheries Management to strengthen community involvement in management of the fisheries through provision of socio-economic analysis and monitoring.

2.8. Increase impact of LVEMP I &II results through effective dissemination of information and technical guidelines through a broad range of media to insure public awareness of issues in the fishery and effective management actions which can be taken.

2.9. Identify and map critical spawning (breeding) and nursery areas of commercial species in order to determine the efficacy of closed seasons/areas and protected areas in protecting the reproductively and recruitment potential of these stocks.

2.10. Provide input to Basin Scale Land Use Planning as well as other in-lake water values for environmental overlay and socio-economic overlays.

2.11. Develop technical guidelines for aquaculture practice from small-scale to large-scale operations in support of interest of potential investors.

2.12. Conduct environmental impact assessment of in-lake cage culture.

2.13. Determine Socio-economic constraints on uptake and success in farm-scale aquaculture.

2.14. Conduct bio-energetic modelling of the lake Victoria food web to identify constraints on energy transfer to commercial fish species.

2.15. Develop a growth model for water hyacinth, which includes critical nutrient concentrations, and light requirements; transfer model to lake Victoria "hot spots" to verify.

2.16. Assess the critical habitat features of the shoreline –littoral zone which are essential to maintain local and offshore fish populations.

2.17. Undertake in collaboration with WID experiments in the near shore-wetland zone and produce technical guidelines for maintenance of shoreline fish habitat and biodiversity.